

### ABSTRACT OF THE DISCLOSURE

A plasma reactor is provided which does not require a high power supply voltage and can form a plasma with a necessary and sufficient average current density over the whole region between a pair of electrodes to efficiently modify a gas flowing between the electrodes. The plasma reactor comprises first and second electrodes positioned to face each other, a dielectric material placed between the two electrodes and an electrical power supply for applying an alternating or pulsed current to the two electrodes and generating a plasma in the gas passing through the gap between the two electrodes to thereby modify the gas. By setting the average current density  $I_{rd}$  of the plasma generated in the gap so that it satisfies the formula  $10^{-4} \text{ A/cm}^2 \leq I_{rd} \leq 10^{-1} \text{ A/cm}^2$ , a concentrated discharge and a barrier discharge are simultaneously generated, thus forming a plasma having a sufficient average current density  $I_{rd}$  for the efficient modification of the gas over the whole region of the gap.